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ABSTRACT

The Civil Service Reform Act of 1978 requires each government agency to develop a performance-based employee appraisal system. The purpose of this study was to determine how to train effectively more than 200,000 Air Force civilian employees to use the Job Performance Appraisal System (JPAS) designed by the Air Force. Experimental comparisons were made of the differing versions of two basic instructional prototypes: instructor-led and self-instructional. Results demonstrate that each approach teaches all occupational levels equally well, provided the instructor-based training is led by someone who is very knowledgeable in the system. Although students responded somewhat more positively to instructor-led training than to self-instructional training, the instructor-led training took more time than the self-instructional training (16 hours for the instructor-led training versus a maximum of 11.5 hours for the self-instruction). Since the demand on human resources for the instructor-led course is significant when thousands of persons must be trained, administratively and in terms of cost-effectiveness, the self-instructional package is preferable. (Author/KC)

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AIR FORCE HUMAN RESOURCES LABORATORY

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JOB PERFORMANCE APPRAISAL SYSTEM TRAINING PROGRAM

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This technical report has been reviewed and is approved for publication.

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The Civil Service Reform Act of 1978 requires each government agency to develop a performance-based employee appraisal system. The purpose of this study was to determine how to effectively train more than 200,000 Air Force civilian employees to use the Job Performance Appraisal System (JPAS) designed by the Air Force. Experimental comparisons were made of the differing versions of two basic instructional prototypes: instructor-led and self-instructional. Results demonstrate that each approach teaches all occupational levels equally well, provided the instructor-based training is led by someone who is very knowledgable in the system. However, students respond significantly more positively to instructor-led training than self-instructional training.

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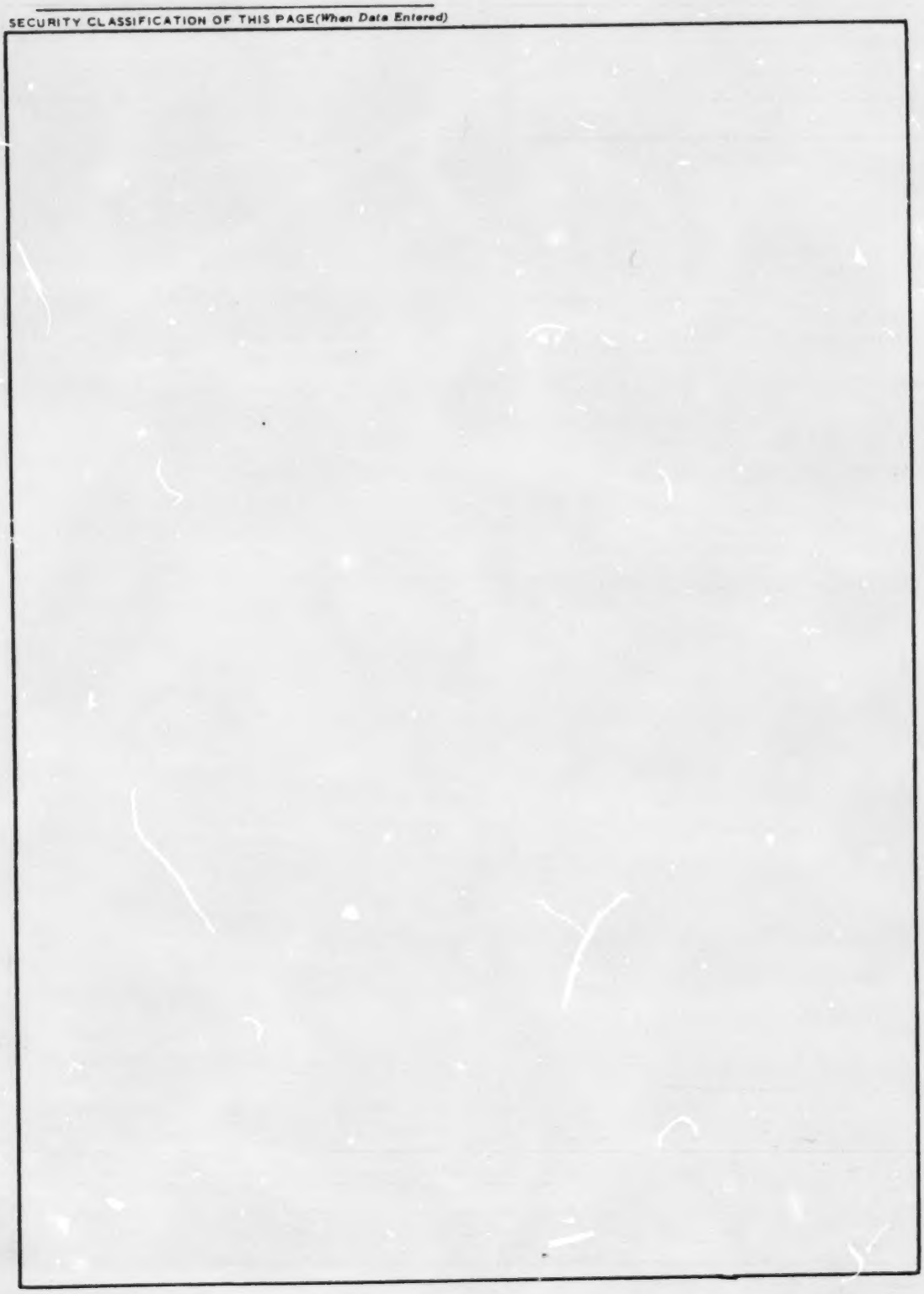

PREFACE

The purpose of this contract was to develop an effective and experimentally validated multimedia training program designed to deliver the necessary skills and knowledge required to participate successfully in the Air Force civilian Job Performance Appraisal System (JPAS). This contract was sponsored by the Air Force Human Resources Laboratory, Brooks Air Force Base (AFB), Texas (Contract Number F33615-79-C-0011).

The project was directed at Applied Science Associates, Inc. (ASA) of Pittsburgh, Pennsylvania, by Dr. Zita Glasgow. Mary Lou Simkins and Dr. Daniel Frezza were responsible for materials development. Ms. Simkins was also responsible for data analyses. The Technical Bibliography was written by Carol Solomon.

AFHRL representatives for this contract were Major John Guerrieri, Project Engineer, and Thomas Watson, Alternate Project Engineer. ASA is appreciative of their assistance in meeting the project's goals.

The project staff is grateful to Jerry Eagan, Civilian Personnel Office, Wright-Patterson AFB, and Art Sandoval, Civilian Personnel Office, Randolph AFB for their cooperation in organizing the two field tests.

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Gary Persons, Wright-Patterson AFB, Ohio
Nancy Thompson, Brooks AFB, Texas
James Earles, Brooks AFB, Texas
Thomas Watson, Brooks AFB, Texas

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I. INTRODUCTION

The Civil Service Reform Act (CSRA) of 1978 requires that each Government agency develop a performance-based employee appraisal system. The system must permit accurate assessment on the basis of objective criteria. Within the parameters of the law, the Air Force Human Resources Laboratory (AFHRL) has developed a new approach to evaluating the job performance of more than 200,000 Air Force civilian employees. The system is called the Job Performance Appraisal System (JPAS).

This system involves breaking each job down into its major components, much the same as is done in preparing a position description. Task Analysis is used to make a list of key work behaviors or practices essential to job performance. Standards of performance are set for each item on the list, and employees are then rated against these behaviors. In order to enhance employee participation and commitment to performance improvement, the employee and supervisor are urged to jointly participate in the process.

The JPAS has three main components: (a) a work plan which sets forth the Job Performance Elements (job behaviors) and associated performance standards; (b) a system for reviewing the employee's progress in meeting the standards; and (c) a system for rating the employee's performance relative to the standards. While any rating system is evaluative in nature, the strength of this approach is that the criteria against which the employee is assessed are very objective. That is, there should be little or no argument about whether a performance standard was met.

The JPAS will be used for all civilian employees not identified as members of the Federal Senior Executive Service or General Manager employees. Therefore, it will be used for all Federal Wage System (FWS) and General Schedule (GS) employees. This means that the same system will be applied across a wide range of jobs at all locations where civilians are employed. Figure 1 contains a flow chart detailing the procedures associated with JPAS.

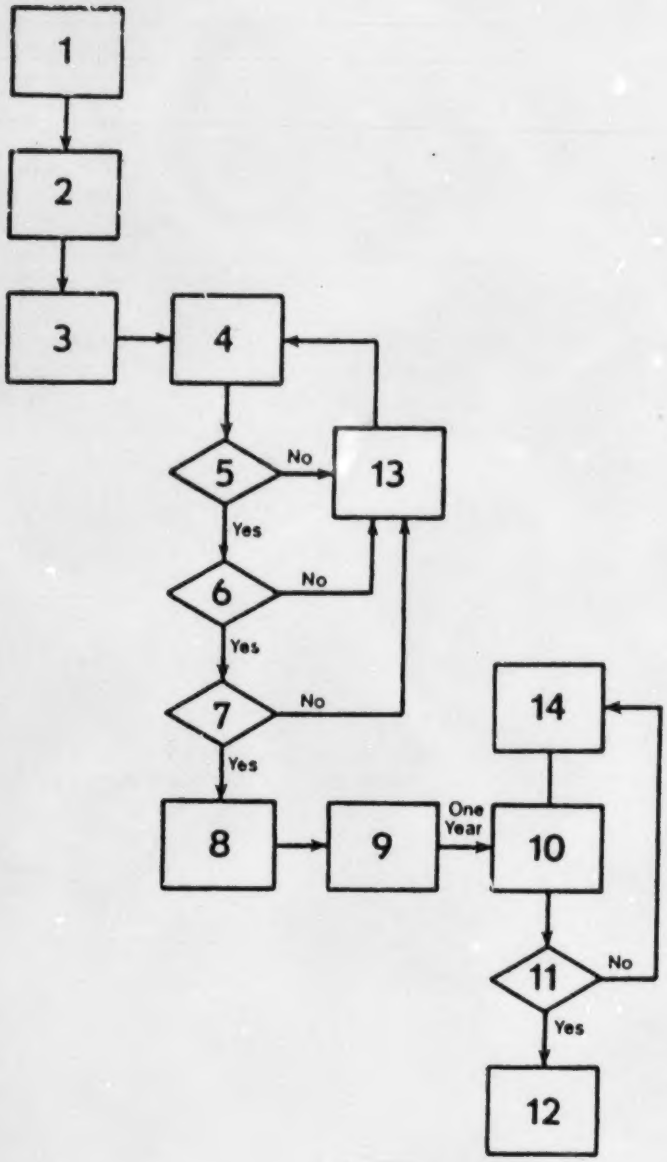
The major objective of this work was to determine experimentally the most efficient, effective, and transportable approach to mediated training in the specific JPAS skills and knowledges required to effectively participate in the system. Elements contributing to the complexity of the problem were as follows:

1. Size and heterogeneity of the population.

2. Variability of media resources and classroom facilities at Air Force Bases where the training is to be conducted.

3. Unknown capabilities of personnel who would be responsible for delivering training.

4. Resistance to the CSRA. Research on development of JPAS indicated that there is considerable resistance to acceptance of the new approach as mandated by the law. Therefore, beyond teaching people to use the system, it was hoped that the training would serve as a means of making JPAS more acceptable to users.



1. Supervisor informs employee of Job Performance Appraisal System.
2. Work Plan Meeting:
   - Indentify Job Performance Elements (JPEs)
   - Determine Critical JPEs
   - Assign Relative Importance Points
   - Set Performance Standards
3. Supervisor signs and sends Work Plan to reviewer.
4. Reviewer checks Work Plan.
5. Indicative of job?
6. Meets organizational requirements?
7. Written in proper format?
8. Reviewer signs and returns Work Plan to supervisor for employee's signature.
9. Employee and supervisor retain a copy of the Work Plan.
10. Supervisor completes and signs appraisal and forwards it to reviewer.
11. Reviewer checks and signs appraisal.
12. Appraisal returned to supervisor to obtain employee's signature.
13. Returned to supervisor for reaccomplishment.
14. Returned to supervisor for reaccomplishment.

Figure 1. Flowchart of JPAS Activities

II. LITERATURE REVIEW

The results of 50 years of comparative research indicate that any medium or media combination can teach about as well as "traditional instruction." This is a meager information yield, given the thousands of research studies that have been conducted. Several reviewers (Allen, 1971; Clark, 1975; Jamison, Suppes, & Wells, 1974; Solomon & Clark, 1977) agree that the most usual kind of study, in which the scores on test X for group A who received treatment A are compared to the scores of group B who received treatment B, simply cannot provide information on those aspects of a treatment which are particularly important instructionally. In general, the more traditionally "well-controlled" a study is, the more likely it is to show no difference between treatments and, equally important, the more likely it is that the medium employed in the study was not used to its best advantage.

Two consistent findings are that (a) active learner response during instruction tends to improve learning (Campeau, 1974), and (b) presenting the learner with knowledge of the correct answer after a response also tends to increase learning (Reid, 1971). Thus, while the review of the literature narrowed the field of possible training methods to those which are active and performance-based, a clear picture of the methods which would be most effective did not emerge.

III. RESEARCH PLAN

Instructional Materials

Two prototype training courses were developed, differing on the type of active responding, feedback employed, and the mode by which information was presented. Each was designed to be of practical use to the student and to develop an attitude of acceptance toward the system. Each covered the same information and had the same objectives. The topics included in the instruction are:

Unit I.	An Overview of the Air Force Civilian Appraisal System
Unit II.	Job Performance Elements (JPEs)
Unit III.	Critical JPEs
Unit IV.	Performance Standards
Unit V.	Priority Weighting
Unit VI.	Work Plan Form
Unit VII.	Effective Communication and the Work Plan Meeting
Unit VIII.	Role of the Reviewer in the Appraisal System
Unit IX.	Periodic Review
Unit X.	JPAS Ratings
Unit XI.	Post-Evaluation Process

Prototype A was instructor-based. That is, an instructor was responsible for conducting lectures, demonstrations and group discussions. Feedback on exercises was given directly by the instructor or through instructor-led discussions. It was designed to allow opportunities for

active discussion and inquiry about the system. This dynamic process addressed the problems associated with acceptance of the system. The materials were detailed instructor lesson plans with overheads and a student Workbook containing exercises and case studies. Instruction took place in a conventional classroom with information presented by the instructor, who also led the class through a series of application exercises contained in the Workbook.

Prototype B was self-instructional. The complexity of the problem necessitated a solution which assured easy implementation and avoided the requirement for locally available media equipment. Consequently, a programmed self-instructional text was designed. The same information used in the instructor-led course was contained in the programmed text. The material consisted of a Resource Book and a Workbook. Students worked at their own pace reading the Resource Book and applying what they read to exercises in the Workbook.

Dependent Variables

A performance test was developed to assess how well each prototype prepared students to use the JPAS. Measures were also developed to evaluate students' attitudes toward the JPAS as a function of the training prototype used and toward the instructional prototypes themselves.

Performance Test. A two-part performance test was developed in which students had to apply the JPAS for three different job holders (a) Job 1, a service station attendant, (b) Job 2, a grocery clerk, and (c) Job 3, a meter reader. These jobs are obviously not Air Force positions, but they were selected for their general familiarity. Since no special expertise is required to understand the job tasks, it was assumed that the content of the tests was not biased.

In Part 1 of the performance test, the task was to write job performance elements (JPEs) and performance standards for each job. The materials used for this task were (a) a position description, (b) an audiovisual presentation, and (c) transcripts of interviews with both the employee and supervisor. In Part 2 the task was to use the rating system to evaluate each job holder's performance relative to the standards. The materials used here were a hypothetical work plan and a sample rating diary. Since both tasks were performed for each of the three jobs, there were a total of six subtests. The test was used in a pilot study at AFHRL to determine:

(a) if the instruments could be easily administered, and
(b) if the materials were sufficient in content to permit performance of the required task.

An in-house tryout was conducted to verify usability of the materials. Five AFHRL staff members participated in the tryout and were selected because of their familiarity with the JPAS. Results of the tryout indicated that the package of materials was easy to administer and sufficient in content to permit development of a feasible work plan. Only minor revisions were required.

Checklists were developed to be used in scoring the work plans. Inter-rater reliability coefficients (Pearson r) for three persons who scored the results of the tryout were .98, .93, and .92.

Attitude Scales. An attitude instrument consisting of a semantic differential scale was developed to ascertain the acceptability of the new system. Students were asked to evaluate the training programs also. Likert-type instruments were developed to assess student attitudes toward the prototypes. They were administered to each group after training. On a scale from 1 to 7, with 1 being the most favorable, students were asked to place an "X" on the line at the point which reflected how they felt about the course on 16 dimensions. The scales were directed at assessing the students' general interest in the course and the perceived effectiveness of specific course components.

Copies of all instruments for the performance test and attitude scales are presented in the appendix. With minor variations, explained later, the same instruments were used in each stage.

General Procedures

The research to determine the more effective approach was conducted in two stages. In stage one, training designs using the two prototypes were tested experimentally at Wright-Patterson AFB. As a result of the findings, changes aimed at enhancing the teaching effectiveness were made in the training design. Then the modified prototypes were compared in the second stage at Randolph AFB. Thus, two research studies were carried out and are described separately in this report.

IV. STAGE ONE COMPARISONS

Independent Variables

Prototype A was broken out into two approaches according to the instructor's knowledge about the JPAS. Two types of instructors were selected to administer Prototype A.

1. Instructors who were unfamiliar with JPAS, but typically would be expected to conduct the training at Air Force bases because of their availability. They were labeled "naive."

2. Instructors who were subject matter experts (i.e., highly knowledgeable about JPAS because of their long-term involvement with the system) and who were, therefore, assumed to be better at conveying accurate information about the system than the naive instructors. The knowledgeable instructors were labeled Subject Matter Experts (SMEs).

Consequently, the experimental treatments were as follows:

Group 1. Students taught by naive (non-SME) instructors using the instructor-based materials.

Group 2. Students taught by SMEs using the instructor-based materials.

Group 3. Students using the self-instructional materials.

The research hypothesis was that the performance of students in using the course materias and attitude of the students toward both the JPAS and the training course itself would be affected differentially by the type of training received.

Procedures

Instructor Orientation. In order to learn about the JPAS, the naive instructors worked through the self-instructional course. The lesson plans for conducting the training were given to them one week in advance of the course. They were told to review the materials as much as needed. Finally, the instructors participated in a question and answer session with a JPAS expert.

No training was offered on classroom presentation methods. Both the SMEs and the naive instructors had had limited teaching experience. In this respect, they were typical of the kinds of personnel who might be expected to teach a JPAS course.

Administration of Training Course. The Stage One field test was conducted at Wright-Patterson AFB. Instructor-based sessions were completed in two days (16 hours) of training. Self-instructional students worked at their own rate. The dependent measure was administered to all groups simultaneously on day three.

Subjects

The field test population consisted of 141 persons randomly sampled from the upper GS levels (a majority were GS 10 or above), some of whom were supervisors. The sample contained no FWS or union personnel. The subjects included engineers, accountants, contract specialists, and others in the professional, technical, and managerial categories.

The field test population was assigned to three experimental treatments. Group 1 consisted of two classes led by "naive" instructors (n=42); Group 2 consisted of two classes led by SMEs (n=39); and Group 3 was the self-instructional (SI) group (n=60). Population figures represent the maximum number of students for which data are available.

Data Analysis

Data were analyzed using the Analysis of Variance (ANOVA) for each of the six performance subtests and attitude scale. When significant differences were found, the t-test for differences among several means was used to identify the source of the difference. The confidence level was set at .05.

Due to student attrition, which was unrelated to the treatment, the total Ns for the dependent variable subtests varied. Reasons for different Ns in Stage One were:

- Participation was voluntary. Students could choose not to attend the entire testing session.
- Student fatigue. Students failed to complete all parts of the test. This was especially true of Part 2 of the dependent variable. Notice that Job 3 of Part 2 has the smallest N (123). This was the last task to be completed in all cases.
- Weather conditions. Icy roads caused several students to be late for the test. Thus, data were unavailable for those jobs administered early on the test day.

Performance Test Results. Significant differences were found on five of the six subtests. This supports the hypothesis of differential effects on performance as a function of training design. Tables 1 and 2 present the ANOVA results for each comparison and Table 3, the means and standard deviations.

Table 1. Stage One ANOVA Results for Performance Subtests

Job 1: Part 1 Performance Standards

Source	SS	df	ms	F	p
Between Groups	144	2	72.0	7.32	<.001
Within Groups	1,337	136	9.83	--	--
Total	1,481	138	--	--	--

Job 2: Part 1 Performance Standards

Source	SS	df	ms	F	p
Between Groups	65	2	32.59	3.34	<.001
Within Groups	1,298	133	10.39	--	--
Total	1,363	135	--	--	--

Job 3: Part 1 Performance Standards

Source	SS	df	ms	F	p
Between Groups	120	2	60.0	5.20	<.01
Within Groups	1,593	138	11.54	--	--
Total	1,713	140	--	--	--

Table 2. Stage Two ANOVA Results for Performance Subtests

Job 1: Part 2 Rating Performance

Source	SS	df	ms	F	p
Between Groups	182	2	90.75	5.78	<.005
Within Groups	2,120	135	15.70	--	--
Total	2,301	137	--	--	--

Job 2: Part 2 Rating Performance

Source	SS	df	ms	F	p
Between Groups	16	2	8.12	.47	NS
Within Groups	2,297	136	17.14	--	--
Total	2,313	138	--	--	--

Job 3: Part 2 Rating Performance

Source	SS	df	ms	F	p
Between Groups	84	2	42.10	5.38	<.01
Within Groups	939	120	7.83	--	--
Total	1,023	122	--	--	--

The t-test comparisons to determine which means differed significantly revealed that naive instructors had a detrimental effect on performance. See Tables 4 and 5 for t-test results. Students trained by SMEs performed significantly better than naive instructors' students on all conditions where a significant difference was found. Students using the self-instructional materials performed significantly better than students taught by naive instructors on four of the subtests.

In comparing the performance of the self-instructional students with students led by SMEs, no significant difference on the six subtests was found. The data indicate that students working alone do as well as students led by SMEs.

Table 3. Stage One Group Means and Standard Deviations on the Performance Test

Part 1. Rating Performance Standards

	Job 1		Job 2		Job 3	
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Group 1 (Naive)	15.02	3.67	16.24	2.83	14.90	3.41
Group 2 (SME-Instructor based)	17.42	2.69	17.92	3.60	17.36	3.24
Group 3 (Self-Instr.)	17.05	2.97	17.60	3.75	16.03	3.41

Scoring of Performance Standards:
5 points given for JPEs.
1 point given for identification of a critical JPE.
13 points given for performance standards.
3 points given for assigning relative importance points.
Total possible score: 22 points

Part 2. Rating Performance

	Job 1		Job 2		Job 3	
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Group 1 (Naive)	12.68	4.37	13.15	4.28	10.79	2.87
Group 2 (Knowl.)	15.50	3.66	13.89	3.76	12.17	2.54
Group 3 (Self-In.)	14.90	3.85	13.92	4.28	12.80	2.91

Scoring of Rating Task
7 points given for correctly using rating form.
2 points given for each correct standard's rating.
Total score Job 1 - 25 points
Total score Job 2 - 27 points
Total score Job 3 - 21 points

t-Test Results

The t-test was used to determine which specific means differed significantly from each other after an F-ratio was found. In all instances, if the difference between any two means is larger than the critical difference, then the means are assumed to be significantly different. The critical difference is the product of the standard error of the difference among means and the t-value for the appropriate degrees of freedom and the alpha level of significance.

Table 4. Stage One: Part I Performance Standards Test Results

t-test for Job 1

		Group 2 $\bar{X}$ = 17.42	Group 3 $\bar{X}$ = 17.05	Critical diff. (at .05 level)
Group 1:	$\bar{X}$ = 15.02	2.40*	2.03*	1.30
Group 2:	$\bar{X}$ = 17.42	--	.37	1.30

t-test for Job 2

		Group 2 $\bar{X}$ = 17.92	Group 3 $\bar{X}$ = 17.60	Critical diff. (at .05 level)
Group 1:	$\bar{X}$ = 16.24	1.68*	1.36*	1.33
Group 2:	$\bar{X}$ = 17.92	--	.32	1.33

t-test for Job 3

		Group 2 $\bar{X}$ = 17.36	Group 3 $\bar{X}$ = 16.03	Critical diff. (at .05 level)
Group 1:	$\bar{X}$ = 14.90	2.46*	1.13	1.41
Group 2:	$\bar{X}$ = 17.36	--	1.33	1.41

Table 5. t-Test for Stage One:
Part 2. Rating Performance Results

t-test - Job 1

		Group 2 $\bar{X}$ = 15.50	Group 3 $\bar{X}$ = 14.90	Critical diff. (at .05 level)
Group 1:	$\bar{X}$ = 12.68	2.82	2.22	1.66
Group 2:	$\bar{X}$ = 15.50	--	.60	1.66

t-test - Job 3

		Group 2 $\bar{X}$ = 12.17	Group 3 $\bar{X}$ = 12.80	Critical diff. (at .05 level)
Group 1:	$\bar{X}$ = 10.79	1.38	2.01	1.26
Group 2:	$\bar{X}$ = 12.17	--	.63	1.26

Attitude Toward System Results. The type of training received had no effect on students' attitude toward the system. Means and standard deviations are presented in Table 6. On a scale from 1 to 7, with 7 being most favorable, the means were 4.46, 3.86, and 4.01, for the three groups respectively. Table 7 presents the ANOVA results. Because there is no significant difference, the hypothesis that training designs would have a differential effect on attitude toward the JPAS was rejected.

Table 6. Groups Means and Standard Deviations for Attitude Toward JPAS

	N	X	SD
Group 1	42	4.46	1.67
Group 2	39	3.86	1.29
Group 3	54	4.01	1.24

Table 7. Stage One ANOVA Results for Attitude Toward JPAS

Source	SS	df	ms	F	p
Between Groups	8.71	2	4.36	2.87	NS
Within Groups	201.29	132	1.52	--	--
Total	210	134	--	--	--

Attitude Toward Training Results. Table 8 presents the means and standard deviations for each group. A significant difference was found in the student evaluation of training. Table 9 presents the ANOVA results.

Table 8. Stage One: Group Means and Standard Deviations for Attitude Toward Training

Group	N	X	SD
1 - Naive Instr.	37	3.55	.97
2 - SME Instr.	38	3.22	.82
3 - Self-Instr.	60	3.89	.97

Table 9. Stage One: ANOVA Results for Attitude Toward Training

Source	SS	df	ms	F	p
Between Groups	10.69	2	5.34	6.07	<.005
Within Groups	115.57	132	.88	--	--
Total	126.26	134	--	--	--

The t-test comparisons showed that students in Group 2 (SME) had a more favorable perception of the training than did the students in Group 3 (self-instructional). See Table 10. Significant differences for naive instructor-led groups and the self-instructional group were not found.

Table 10. Stage One: t-Test for Attitude Toward Training

	Group 2 $\bar{X}$ = 3.22	Group 3 $\bar{X}$ = 3.89	Critical Difference (at .05 Level)
Group 1: $\bar{X}$ = 3.55	.33	.34	.40
Group 2: $\bar{X}$ = 3.22	--	.67*	.40

The hypothesis that training prototype affects student attitude toward the course itself was confirmed. Students seem to prefer a course conducted by an SME over a self-instructional package ($p<.005$). This preference is not obtained when the instructor is not an SME.

V. STAGE TWO COMPARISONS

Independent Variables

The prototypes evaluated in this stage were enhanced versions of those tested in Stage One. Specific enhancement strategies were as follows:

1. The instructor-based and self-instructional prototypes were revised to overcome learning difficulties common to both. In addition, the JPAS rating procedures had been changed by AFHRL in the interim, and the course was revised to accommodate the new procedures.

2. The naive instructor training design was eliminated on the basis of Stage One results.

3. The SME-led training design was modified to add preparation on teaching skills and a more in-depth explanation of the JPAS to the instructors. All instructors in Stage One had expressed some anxiety about their delivery skills. Therefore, a one-half day training session was provided to allow practice and feedback on presentation methods and group facilitating. The hypothesis was that assistance on teaching skills would result in better student performance and attitude.

4. A one-half day small group exercise on applying JPAS to a job was developed to be used after students had completed the self-instructional package. The hypothesis was that the addition of an opportunity for group discussion would result in better student performance and attitude.

Consequently, the experimental treatments were:

Group 1. Students using the basic self-instructional package.

Group 2. Students using the self-instructional package with a one-half day group application exercise.

Group 3. Students taught by SMEs who had participated in an instructor training session and used the instructor-based package.

The general research hypothesis was that performance and attitude of the students would be differentially affected by the type of training received.

Dependent Variables

Dependent measures were the same two-part performance test and the attitude scales used in Stage One. However, to reduce testing time, the performance test consisted of applying the JPAS to two jobs only: the service station attendant and the meter reader. Since the JPAS rating procedures had changed, a new scoring mechanism was devised for Part 2 of the performance test.

Procedures

The one-half day training session for instructors was conducted the day before the sessions began. The field test was conducted at Randolph AFB. Two days were allotted for instruction, followed by test administration on the third day.

Subjects

The subjects were 92 workers and supervisors randomly drawn from the lower GS levels and assigned to the experimental treatments. Subjects were mainly clerical and AWS employees. Group 1 (n=29) received the self-instructional training, Group 2 (n=18) received the self-instructional training and group application exercise, and Group 3 (n=45) received the SME training. Population figures represent the maximum number of students for which data are available.

Data Analysis

Data were analyzed using the ANOVA for each of the four subtests and the attitude scales. When significant differences were found, the t-test for differences among several means was used to identify the source of the differences. The confidence level was set at .05.

Due to student attrition, which was non-treatment related, the total N's for the dependent variable components vary.

Performance Test Results. Performance test results showed no significant differences in the ability of students to use the JPAS. The enhancements of each prototype had no effect on learning compared to the basic self-instructional prototype. Therefore, the research hypothesis of differential effects was rejected. As in Stage One, the self-instructional course and the SME-led course were equally effective. Table 11 presents the ANOVA results, and Table 12 the means and standard deviations.

Table 11. Stage Two ANOVA Results for Performance

Job 1: Part 1 Performance Standards

Source	SS	df	ms	F	p
Between Groups	9.78	2	4.89	.52	NS
Within Groups	785.81	83	9.47	--	--
Total	795.59	85	--	--	--

Job 2: Part 1 Performance Standards

Source	SS	df	ms	F	p
Between Groups	12.21	2	6.10	.52	NS
Within Groups	980.16	83	11.81	--	--
Total	992.37	85	--	--	--

Job 1: Part 2 Performance Standards

Source	SS	df	ms	F	p
Between Groups	18.24	2	9.12	.15	NS
Within Groups	5,036.76	81	62.18	--	--
Total	5,055.00	83	--	--	--

Job 2: Part 2 Performance Standards

Source	SS	df	ms	F	p
Between Groups	77.22	2	38.61	.38	NS
Within Groups	7,859.58	77	102.07	--	--
Total	7,936.8	79	--	--	--

Table 12. Stage Two Group Means and Standard Deviations on the Performance Test

Part 1. Rating Performance Standards

	Job 1		Job 2	
	$\bar{X}$	SD	$\bar{X}$	SD
Group 1 (Self-Instructional)	15.41	3.13	15.86	3.82
Group 2 (Self-instructional plus group application	16.29	3.60	17.00	4.07
Group 3 (SME-Instructor)	16.05	2.85	16.27	2.94

Scoring of Performance Standards:
5 points given for JPEs.
1 point given for identification of a critical JPE.
13 points given for performance standards.
3 points given for assigning relative importance points.
Total possible score: 22 points

Part 2. Rating Performance

	Job 1		Job 2	
	$\bar{X}$	SD	$\bar{X}$	SD
Group 1 (Self-Instructional)	24.85	8.36	13.38	10.45
Group 2 (Self-Instructional plus group application)	25.53	8.13	25.43	11.26
Group 3 (Self-Instructor)	25.90	7.48	25.50	9.45

Scoring of Rating Task
7 points given for correctly using rating form.
2 points given for each correct standard's rating.
Total score Job 1 - 25 points
Total score Job 2 - 27 points
Total score Job 3 - 21 points

Attitude Results. As in Stage One, results showed that type of training had no effect on attitude toward JPAS. Table 13 presents the ANOVA results. Table 14 presents the means and standard deviations.

Table 13. Stage Two ANOVA Results for Attitude Toward the JPAS

Source	SS	df	ms	F	p
Between Groups	3.26	2	1.63	1.26	NS
Within Groups	108.01	84	1.29	--	--
Total	111.27	86	--	--	--

Table 14. Group Means and Standard Deviations for Attitude Toward JPAS

	N	X	SD
Group 1	29	4.79	1.25
Group 2	15	4.42	.99
Group 3	43	4.37	1.10

The evaluation of training results revealed that students preferred the SME-led course over both of the other types of training courses administered. Table 15 presents the means and standard deviations (1=favorable, 7=unfavorable), Table 16 presents the ANOVA results. Table 17 shows t-test results.

Table 15. Stage Two: Group Means and Standard Deviations for Attitude Toward Training

Group	N	X	SD
1 - Self Instr.	29	3.06	1.11
2 - Self-Instr./ Small Group	18	3.33	.79
3 - SME Instr.	45	2.55	.85

Table 16. Stage Two ANOVA Results for Attitude Toward Training

Source	SS	df	ms	F	p
Between Groups	16.39	2	8.20	8.37	<.001
Within Groups	87.58	89	.98	--	--
Total	103.97	91	--	--	--

Table 17. t-Test for Stage Two: Attitude Toward Training

Here the Ns were disparate. That is, there were more than twice as many in the largest group as in the smallest group (Group 1 N was 18 while Group 3 N was 45). Therefore, the standard error was computed separately for each comparison. The results are presented below.

Group 2 vs. Group 1 (C diff. = .60)
3.33 - 3.06 = .17 (non-significant)

Group 2 vs. Group 3 (C diff. = .54)
3.33 - 2.55 = .78 (significant)

Group 1 vs. Group 3 (C diff. = .48)
3.06 - 2.55 = .51 (significant)

VI. GENERAL DISCUSSION AND CONCLUSIONS

Naive Instructors vs. SMEs

In and instructor-based system, subject matter expertise appears to be important in training people to use the JPAS. Instructors who were labled naive had a detrimental effect on learning despite their precourse orientation to the JPAS and the use of highly detailed lesson plans. Observations and post-hoc analysis of the naive instructors' behavior indicate that they were less able to field questions about the system and that they introduced their misconceptions about the system. Students' attitudes toward the training is congruent with the finding that the subject matter expertise is a significant factor, as students taught by SMEs were more favorably inclined toward the training than those taught by non-SMEs.

Clearly, on the basis of performance and attitude toward the training, field test results showed that if an instructor-based program is used to teach the JPAS, the instructor should be an SME.

The SMEs employed in this study were drawn from the AFHRL at Brooks AFB and the contractor (Applied Science Associates) employees who participated in development of the course. All of these people had been working with the JPAS for several months (i.e., from 4 months to more than 1 year). Thus, their indoctrination was long and intensive.

If an instructor-based system is selected, a training program which thoroughly indoctrinates instructors in the use of the JPAS must be developed. The self-instructional package used to train the naive instructors in the Wright-Patterson field test was obviously inadequate. Just how much more training and what type of instruction is necessary to produce results similar to those achieved in the field test remains an empirical question. One approach to determining the nature of a JPAS instructor training package is to perform an analysis of the tasks performed by personnel in the process of becoming SMEs. In this way, the experiences necessary to becoming an SME can be identified and training can be designed to simulate these conditions.

Self-Instructional vs. SME-led Training

There are no differences in student performance or attitude toward the system between students using the self-instructional package and those taught by SMEs[1]. However, students' attitudes toward the training is more favorable when instruction is presented by an SME. While the difference is statistically significant, the difference of about one half a point (.51) must be evaluated in terms of practical implications.

On a scale of one to seven, with one being the most favorable, the mean of the self-instructional group was 3.06, which is on the moderate to favorable side of the scale as is the SME-led group with a mean of 2.55. The evidence reveals no real dislike for the self-instructional approach, but clearly the SME-led training is preferred. But, since this slight preference for SME-led training does not translate into better performance and acceptance of the system, the importance of this difference is questionable.

In comparing the practical benefits of the two prototypes, however, there are certain administrative considerations which do appear to make a difference in terms of time and resource allocations.

Figure 2 shows the completion times for the students who participated in the self-instructional sessions in Stage One. At the end of the first day, 33 percent of the students turned in the instructional materials and returned to their job. By 10 a.m. of the second day (after 10 instructional hours) an additional 40 percent were ready to return to work. All of the students turned in the materials within 14 hours. The median completion time was nine hours. Obviously, all students in the group-paced, instructor-led training finished at the same time (after 16 hours). As shown in Figure 3, essentially the same effect was found in the Stage Two test at Randolph AFB. That is, 50 percent of the students were finished after nine hours, and everyone was finished after 11.5 hours.

If time away from the job is a factor, clearly the self-instructional approach is preferable since students achieved the same performance level as with the instructor-based training, but were returned to work sooner. This is a significant factor when large numbers of personnel are being trained.

The self-instructional package can be administered by almost anyone, whereas the instructor-led course requires an SME as the instructor. As discussed above, all potential JPAS instructors should become experts in the system and become familiar with the detailed lesson plans for conducting the training. Once the course is underway, the level of effort for actual administration of the self-instructional package is lower for two reasons: (a) the self-instructional administrators finish as soon as the last student has turned in his materials, approximately 12 to 14 hours, while SME

[1]This study did not take the reading ability into account. Subjects were drawn from the populations at the bases and randomly assigned to treatments. No measures of reading ability were given. Therefore, the effectiveness of these packages for individuals with low reading ability is not known.

Figure 2. Self-Instructional Completion Time

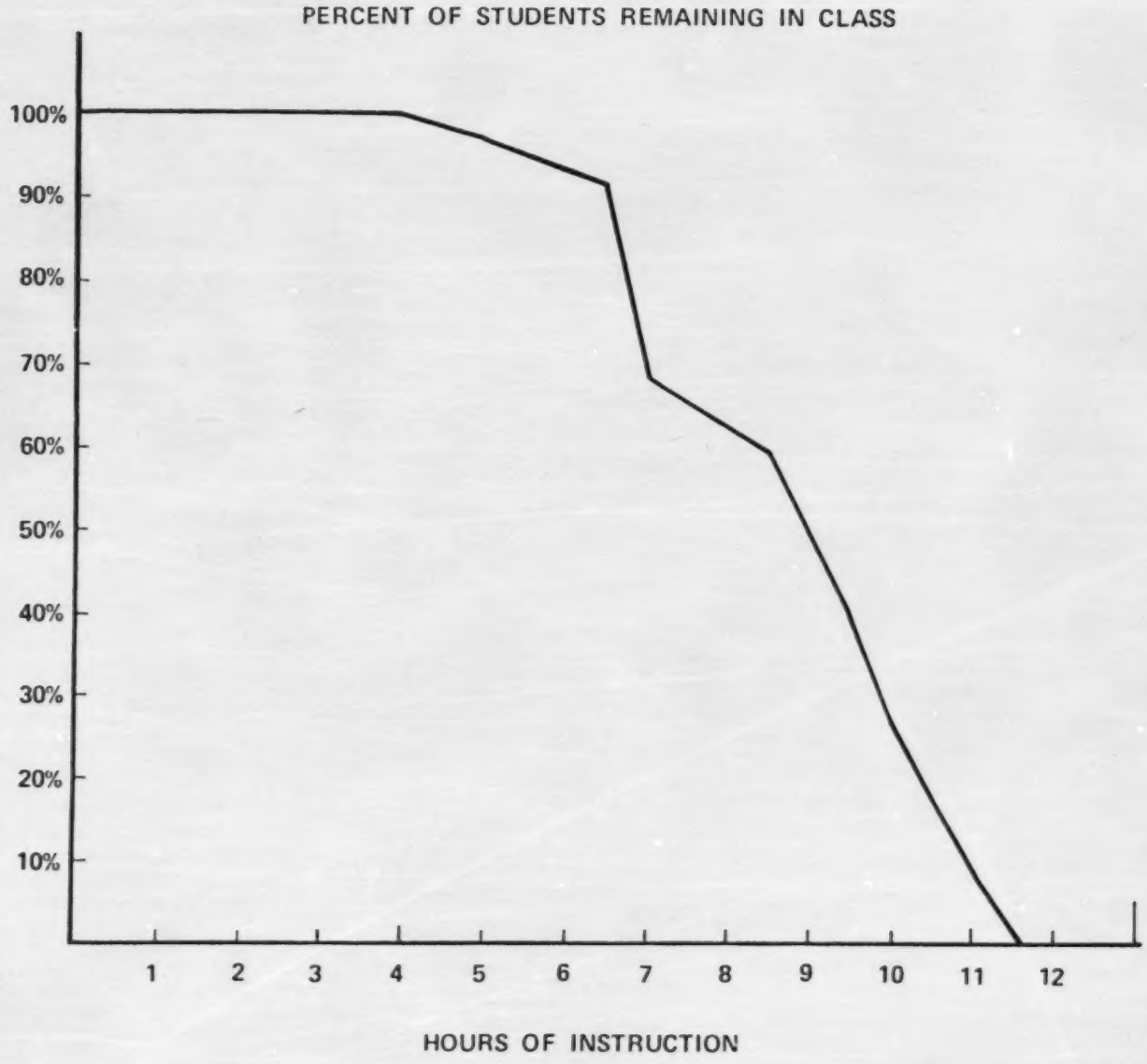


Figure 3. Stage Two. Completion Times of Self-Instructional Students

instructors require 16 hours to administer the course, and (b) the self-instructional administrators can monitor 35 or more students with ease, while the SME instructors should, according to the course design, teach no more than 25 persons.

Certainly, the demand on human resources for the instructor-led course is significant when thousands of persons must be trained. Therefore, administratively and in terms of cost-effectiveness, the self-instructional package is preferable.

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APPENDIX

MEASUREMENT DEVICES

Check One:

Self-Instructional __

Instructor - led __ Instructor's name _____

Date: _____

ATTITUDE TOWARD JPAS

Think about the Job Performance **Appraisal** System process. Then for each pair of words listed below, put an "X" on the line at the point which reflects how you feel about it. You should record an "X" for each pair of words.

JOB PERFORMANCE EVALUATION SYSTEM

Bad ___:___:___:___:___:___:___: Good

Complete ___:___:___:___:___:___:___: Incomplete

Unsuccessful ___:___:___:___:___:___:___: Successful

Unimportant ___:___:___:___:___:___:___: Important

Worthless ___:___:___:___:___:___:___: Valuable

Satisfactory ___:___:___:___:___:___:___: Unsatisfactory

Negative ___:___:___:___:___:___:___: Positive

Wise ___:___:___:___:___:___:___: Foolish

Strong ___:___:___:___:___:___:___: Weak

Easy ___:___:___:___:___:___:___: Hard

Dumb ___:___:___:___:___:___:___: Smart

Timely ___:___:___:___:___:___:___: Untimely

Wrong ___:___:___:___:___:___:___: Right

Interesting ___:___:___:___:___:___:___: Dull

Practical ___:___:___:___:___:___:___: Impractical

Useless ___:___:___:___:___:___:___: Useful

GROUP #_____

Evaluation of the Training
Self-Instructional

This evaluation is intended to find out about your attitude toward the course. Read each item and place an "X" in the line at the point which reflects how you feel about it. You should record an "X" for each pair of words.

1. How did the course compare to other training you have taken?

   Good 1___:2___:3___:4___:5___:6___:7___: Bad

2. How interesting was the course in general?

   Interesting 1___:2___:3___:4___:5___:6___:7___: Boring

3. How often would you like to have courses like this one again?

   Frequently 1___:2___:3___:4___:5___:6___:7___: Rarely

4. How well did the course prepare you to apply the elements of the JPAS system on the job?

   a. Job Performance Elements?

   Very Well 1___:2___:3___:4___:5___:6___:7___: Very poorly

   b. Critical Elements?

   Very Well 1___:2___:3___:4___:5___:6___:7___: Very poorly

   c. Performance Standards?

   Very Well 1___:2___:3___:4___:5___:6___:7___: Very poorly

   d. Priority Weights?

   Very Well 1___:2___:3___:4___:5___:6___:7___: Very poorly

Self-Instructional, continued

5. How well did the course prepare you to complete the forms used in the system?

   a. Work Plan Form?

   Very Well 1___:2___:3___:4___:5___:6___:7___: Very poorly

   b. Quarterly Work Plan Progress Review?

   Very Well 1___:2___:3___:4___:5___:6___:7___: Very poorly

   c. JPAS Rating Form (yearly)?

   Very Well 1___:2___:3___:4___:5___:6___:7___: Very poorly

6. How effective were the following materials in helping you learn?

   a. Practical exercises in the workbook?

   Effective 1___:2___:3___:4___:5___:6___:7___: Ineffective

   b. Case Studies in Appendix A of the Workbook?

   Effective 1___:2___:3___:4___:5___:6___:7___: Ineffective

7. How often did you have questions that the manual did not address?

   Very often 1___:2___:3___:4___:5___:6___:7___: Rarely

8. How sufficient were the answers to the exercises?

   Sufficient 1___:2___:3___:4___:5___:6___:7___: Insufficient

9. How well did you like working independently?

   Very much 1___:2___:3___:4___:5___:6___:7___: Not at all

10. How clear were the directions for the activities in the manual?

    Very Clear 1___:2___:3___:4___:5___:6___:7___: Very Unclear

GROUP #_____

Evaluation of the Training
Group-Paced

This evaluation is intended to find out about your attitude toward the course. Read each item and place an "X" in the line at the point which reflects how you feel about it. You should record an "X" for each pair of words.

1. How did the course compare to other training you have taken?

   Good 1____:2____:3____:4____:5____:6____:7____: Bad

2. How interesting was the course in general?

   Interesting 1____:2____:3____:4____:5____:6____:7____: Boring

3. How often would you like to have courses like this one again?

   Frequently 1____:2____:3____:4____:5____:6____:7____: Rarely

4. How well did the course prepare you to apply the elements of the JPAS system on the job?

   a. **Job Performance Elements?**

   Very Well 1____:2____:3____:4____:5____:6____:7____: Very poorly

   b. Critical Elements?

   Very Well 1____:2____:3____:4____:5____:6____:7____: Very poorly

   c. Performance Standards?

   Very Well 1____:2____:3____:4____:5____:6____:7____: Very poorly

   d. Priority Weights?

   Very Well 1____:2____:3____:4____:5____:6____:7____: Very poorly

Group-Paced, continued

5. How well did the course prepare you to complete the forms used in the system?

   a. Work Plan Form?

   Very Well 1:___:2___:3___:4___:5___:6___:7___: Very Poorly

   b. Quarterly Work Plan Progress Review?

   Very Well 1___:2___:3___:4___:5___:6___:7___: Very Poorly

   c. JPAS Rating Form (yearly)?

   Very Well 1___:2___:3___:4___:5___:6___:7___: Very Poorly

6. How effective were the following materials in helping you learn?

   a. Practical exercises in the workbook?

   Effective 1___:2___:3___:4___:5___:6___:7___: Ineffective

   b. Case Studies in Appendix A of the Workbook?

   Effective 1___:2___:3___:4___:5___:6___:7___: Ineffective

7. How effective were the following in supporting the instruction?

   a. Instructor's presentation?

   Very Ineffective 1___:2___:3___:4___:5___:6___:7___: Very Effective

   b. Group interaction?

   Very Ineffective 1___:2___:3___:4___:5___:6___:7___: Very Effective

   c. Your participation?

   Very Ineffective 1___:2___:3___;4___:5___:6___:7___: Very Effective

   d. Audio-Visual aids?

   Very Ineffective 1___:2___:3___:4___:5___:6___:7___: Very Effective

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